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**Editor-in Chief**

Jerome M. Hershman, MD  
VA Greater Los Angeles Healthcare System  
and UCLA School of Medicine  
Endocrinology 111D  
11301 Wilshire Blvd  
Los Angeles, CA 90073  
Telephone: 310-268-3852 Fax: 310-268-4879  
Email: clinicalthyroidology@thyroid.org

**Associate Editors:**

**Albert G. Burger, MD**  
Professor, University of Geneva  
Geneva, Switzerland  
Email: clinicalthyroidology@thyroid.org

**Stephanie L. Lee, MD, PhD**  
Director of the Thyroid Health Center  
Boston University Medical Center  
Boston, MA  
Telephone: 617-638-8530 Fax: 617-638-7221  
Email: clinicalthyroidology@thyroid.org

**Jorge H. Mestman, MD**  
Professor of Clinical Medicine and OB/GYN  
University of Southern California  
Keck School of Medicine  
Los Angeles, CA  
Telephone: 323-442-6179  
Email: clinicalthyroidology@thyroid.org

**Stephen W. Spaulding, MD**  
Professor of Medicine  
Department of Medicine  
University at Buffalo, SUNY  
Telephone: 716-862-6530 Fax: 716-862-6526  
Email: clinicalthyroidology@thyroid.org

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6066 Leesburg Pike, Suite 550  
Falls Church, VA 22041  
Telephone: 703-998-8890  
Fax: 703-998-8893  
Email: thyroid@thyroid.org

**Designed By**

Karen Durland (kdurland@gmail.com)

**Clinical Thyroidology**

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# Clinical THYROIDOLOGY

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## Microcalcification and Intranodular Coarse Calcification Are Often Found on Preoperative Ultrasounds of Papillary Thyroid Carcinoma

Stephanie L. Lee

Kim BK, Choi YS, Kwon HJ, Lee JS, Heo JJ, Han YJ, Park YH, Kim JH.  
Relationship between patterns of calcification in thyroid nodules and  
histopathologic findings. *Endocrine J.* October 6, 2012 [Epub ahead of  
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### SUMMARY

#### Background

Thyroid nodules are commonly seen in adults. Studies suggest a prevalence of 2% to 6% on palpation, 19% to 35% on ultrasound, and 8% to 65% in autopsy data (1). Most professional endocrine professional societies' guidelines, including the 2009 ATA guidelines (2), recommend sonographic examination as part of the evaluation for malignancy of all thyroid nodules. The sonographic features of microcalcification are highly specific (89.1% to 96.8%) but not sensitive (20% to 24.3%) for papillary thyroid carcinoma (3,4). Macrocalcification has previously been associated with an increased risk of thyroid malignancy (5). The objective of this study was to determine which pattern of calcification is predictive of malignancy in a large number of thyroid nodules confirmed as benign or malignant after resection.

#### Methods and Results

The aim of this study was to determine which pattern of calcification is associated with thyroid malignancy. This is a single-institution retrospective study of 1431 thyroid nodules in 1078 patients between January 2008 and July 2011 who had a preoperative ultrasound prior to thyroid surgery. The male:female ratio was 5.3:1 and the mean ( $\pm$ SD) age was 47.2 $\pm$ 11.1 years. The reason for surgery was usually increased risk of malignancy or cosmetic concerns. Thyroid ultrasound was performed by two radiologists with a 5- to 12-MHz linear array

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## Microcalcification and Intranodular Coarse Calcification Are Often Found on Preoperative Ultrasounds of Papillary Thyroid Carcinoma

transducer. All images were independently reviewed by an endocrinologist whose specialty was thyroid disease. The calcifications were categorized as microcalcification (fine stippling, <2 mm), annular-like peripheral calcification (coarse calcification around the surface of the nodule in an eggshell pattern), crescent-like calcification (irregular curved line of coarse calcification), intranodular coarse, disorganized calcification >2 mm with acoustic shadowing within a nodule, or a calcified spot (single spot of macrocalcification not associated with a discrete nodule). The average size of the resected nodule was 1.2±0.8 cm (range, 0.1 to 6 cm). A total of 91.1% of the resected nodules were thyroid cancer and 8.9% were benign nodules; 94.7% of the malignancies were papillary thyroid carcinoma. The data were analyzed as a frequency with a 2-by-2 table to calculate sensitivity,

specificity, and positive predictive value. Calcifications were detected in 38.6% of all nodules, 40.2% of malignant nodules, and 22.2% of benign nodules. The distribution of calcification in malignant nodules was microcalcification in 42.9%, intranodular in 26.5%, calcified spot in 13.4%, crescent in 11.1%, and annular-type in 5.9%. The only forms of calcification associated with thyroid malignancy were microcalcification (odds ratio [OR], 3.5; 95% CI, 1.6 to 7.7; P<0.001) and intranodular coarse calcification (OR, 2.4; 95% CI, 1.1 to 5.6; P = 0.035).

### Conclusions

In this retrospective study, thyroid malignancy frequently was found on preoperative ultrasound to contain microcalcification (42.9%) and intranodular coarse calcification.

### ANALYSIS AND COMMENTARY ● ● ● ● ● ● ● ● ● ●

Sonographic evidence of calcification is found in both benign and malignant nodules. This retrospective study is significant because of the large number of patients who had both a preoperative thyroid ultrasound and thyroidectomy to confirm pathology. A limitation of this study is that more than 90% of the subjects had thyroid cancer. The benign nodule cohort contained only 126 nodules, as compared with the cancer cohort,

which contained 1305 nodules. Thus, the frequency of the calcification patterns cannot provide accurate statistics of sensitivity or specificity for detecting thyroid malignancy based on a preoperative ultrasound. This study does confirm that both microcalcification and intranodular coarse calcification are commonly seen in thyroid malignancy. It is important to recognize that other forms of calcification (annular, crescent, spot) can be seen in thyroid cancer and are not a sonographic sign that a thyroid nodule is benign.

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